DOCUMENT RESUME

ED 451 895 PS 029 339

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TITLE Reading between the Pixels: Parent-Child Interaction While Reading Online Storybooks.

PUB DATE 2001-04-00

NOTE 28p.; Paper presented at the Biennial Meeting of the Society for Research in Child Development (Minneapolis, MN, April 19-22, 2001).

PUB TYPE Reports - Research (143) -- Speeches/Meeting Papers (150)

EDRS PRICE MF01/PC02 Plus Postage.

DESCRIPTORS *Caregiver Speech; Emergent Literacy; Language Acquisition; *Parent Child Relationship; *Parents; Parents as Teachers; *Preschool Children; Reading; Reading Processes

IDENTIFIERS Dyads; *Online Reading; *Shared Reading

ABSTRACT

Noting that joint storybook reading by children and adults provides a context for interactions that promote language development and literacy, this exploratory study examined whether parent-child reading of storybooks online might elicit the same sorts of interaction that have been observed for joint reading of traditional books. Participating in the study were seven parent-child dyads. Each dyad was observed while reading two online storybooks that presented branching stories in which readers' choices helped to determine the course of the story. Findings indicated that parents and children engaged in many of the same behaviors found in past literature, and that utterances involved similar levels of abstraction. When subjects reached choice points in the interactive, branching stories, it was typically the children who selected the path that the story would take, either by themselves or with their parents. In this way, children not only saw and heard the stories, but also helped to determine the course of events, with implications for emergent literacy. (Appended are the coding scheme used in the present study, sample story pages, and descriptive data. Contains 14 references.) (Author/KB)

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ED 451 895

Reading between the pixels: Parent-child interaction while reading online storybooks

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Sesame Workshop

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April, 2001

PS 029339

Poster presented at the biennial meeting of the Society for Research in Child Development, Minneapolis, MN.

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Abstract

To examine whether parent-child reading of online storybooks might elicit the same sorts of interaction that have been observed for joint reading of traditional books, an exploratory study was conducted with seven parent-child dyads. Each dyad was observed while reading two online storybooks that presented branching stories in which readers' choices helped to determine the course of the story. Results indicated that parents and children engaged in many of the same behaviors found in past literature, and that utterances involved similar levels of abstraction. When choice points were reached in the interactive, branching stories, it was typically the preschool children who selected the path that the story would take, either by themselves or with their parents. In this way, children not only saw and heard the stories, but also helped to determine the course of events, with implications for emergent literacy.

Introduction

It is widely held that joint storybook reading by children and adults (typically teachers or parents) provides a context for interactions that promote language development and literacy (e.g., Binkley, 1988; Teale & Sulzby, 1989). Indeed, numerous emprirical studies have shown these sorts of interactions to be related to gains in areas such as vocabulary acquisition, reading comprehension, and the quantity of books subsequently purchased for leisure reading (e.g., Morrow, 1990; Ninio, 1983; Ninio & Bruner, 1978; Rosenhouse, Feitelson, Kita, & Goldstein, 1997; Taverne & Sheridan, 1995; Whitehurst et al., 1988; see Kerr & Mason, 1994 for a review). Moreover, this literature has identified specific elements of adult behavior that can contribute directly to children's emergent literacy, such as labelling objects on the screen, asking open-ended questions, or tying aspects of the story to events in the child's own life.

Such interactions may be less dependent on the specific medium of print than on the presence of a narrative that adults and children share. Lemish and Rice (1986) found similar types of interactions to occur between parents and children during joint co-viewing of television programs such as *Sesame Street*.

One new medium that has shown meteoric growth in its reach to families in recent years has been the Internet. It is estimated that approximately 6,000,000 homes with children between the ages of 2 and 11 have access to the Internet (Media Metrix, 2000). Indeed, statistics on traffic to sites with content for preschool children suggest that many preschoolers are using the World Wide Web; for example, approximately 415,000 unique visitors come to the *Sesamestreet.com* Web site each week, with much of the usage centering on material for preschoolers to use with their parents.

Many Web sites intended for joint use by preschool children and their parents, such as *Alfy.com*, Disney's *Mouse House Jr.*, or *Sesamestreet.com*, feature storybooks that can be read online, one page at a time. These online storybooks differ from their traditional counterparts, not only in the medium by which they are delivered, but also in that online books often present *branching stories* -- that is, interactive stories containing specified choice points in which readers choose the path that the story will follow. For example, one page might ask, "What should Grover do: Go and see what it is in the corner? Or hide under the blankets? " The story then follows one of two completely different paths, depending on the reader's choice (Fig. 1).

Fig. 1 about here

Because of the differences in both medium (computer vs. print) and structure (single vs. branching stories), questions arise as to nature of adult-child interaction when reading online storybooks. On the one hand, Lemish and Rice's (1986) findings regarding joint television viewing suggest that online storybooks might elicit the same patterns of interaction that have been observed in traditional storybook reading, despite the difference in medium. Indeed, the use of branching stories might even be more conducive to such interactions as parents and children reach choice points in the story and need to decide how to proceed. On the other hand, Pellegrini, Perlmutter, Galda, and Brody (1990) found mother-child interactions to differ by the familiarity of the format of text being read. Thus, patterns of interaction might differ as a result of the relative novelty of the online medium or branching-story format. The present exploratory study provides an initial investigation into this issue with a small number of parent-child pairs.

Method

Subjects

Subjects were seven parent-child dyads living in the New York metropolitan area, most of whom were recruited through a database of subscribers to the Sesame Workshop's electronic newsletters. The sample included six mothers and one father, plus four boys and three girls; two of the children were three years old, and five were four years old. Five dyads were white, and two were Latino.

To gauge the subjects' prior familiarity with the World Wide Web, we asked parents how often they and their children use the Web. All of the parents reported that they go online by themselves every day, and approximately once per month with their child. This rate of usage is consistent with that seen in other unpublished research and surveys conducted by the Sesame Workshop research team.

Materials

Two online *Sesame Street* storybooks, taken from a set of storybooks that had been produced for America Online, were used. One, "Good Night Grover," concerned Grover's fear of the dark and the creatures that he imagined in his room as he was going to bed. The other, "A Silly Sandwich for Bert," featured Ernie trying to make a sandwich for his friend Bert.

Each page of the storybooks consisted of a brief text passage and an illustration, as in traditional picture books. One page appeared on the screen at a time, and users clicked on an icon at the bottom of the page to "turn" to either the next or the previous page in the story. Each storybook contained three choice points that asked users to direct the course of the story, as in Fig. 1. The total length of each storybook ranged from 10 to 14 pages, depending on the choices users made.

Procedure

Each dyad was tested individually. The parent and child were brought into the testing room and seated in front of a Pentium computer connected to a T1 line to minimize the impact of download time. The child was given the choice of sitting either in the parent's lap, or in a separate chair next to the parent.

Subjects were told that this was a test of two online storybooks. They were asked to read the storybooks just as they would at home, after which they would be

interviewed for their reactions. No mention was made of our interest in interaction or discussion during reading.

The experimenter then put the title page of the first page on the screen. For the duration of reading, the experimenter did not intervene further unless technical problems caused a computer crash or subjects inadvertently clicked on something that took them completely out of the book.

Each dyad was videotaped as they read the two books. In addition, live observations were conducted simultaneously.

Coding

Parents' and children's behavior while reading each story was coded according to a scheme consistent with that used in prior research on joint reading of traditional books and co-viewing of television (e.g., Lemish & Rice, 1986; Morrow, 1990; Ninio, 1983; Ninio & Bruner, 1978; Pellegrini et al., 1990; Rosenhouse et al., 1997; Sorsby & Martlew, 1991; Taverne & Sheridan, 1995; Whitehurst et al., 1988). Separate but parallel coding schemes were devised for parents' and children's behaviors, and distinctions were made between behaviors that initiated interactions and those that were produced in response to something the other person said or did.

Within each broad category of behaviors (parent initiating, parent responding, child initiating, and child responding), behaviors were divided into six subcategories: *Designating/labelling* (e.g., "That's a...," "Look at the..."), *Story/comprehension-related* (e.g., reviewing prior parts of the story, predicting events in the story), *External references* (e.g., tying objects or events in the story to the child's life), *Medium-specific references* (e.g., asking where on the screen to click, showing the child which button to press on the mouse), *Reading the text* on the page, and *Miscellaneous* (e.g., laughter or "Wow" when not used as a response or reinforcer). The complete coding scheme can be found in the Appendix.

To measure reliability of the coding scheme, a subset of the data was coded independently by two raters. The percent agreement between the two raters was 90%.

Results

Who drove the experience?

In six of the seven dyads, preschool children held and physically controlled the mouse at least part of the time. Four children controlled the mouse all of the time, two shared control with their parents, and in only one case did the parent do all of the clicking.

Even when parents physically held the mouse, however, the children almost invariably participated in deciding which option to choose when they reached a choice point in the stories. The typical scenario was for parents to read the options presented at the choice point and ask the child which one he or she wanted to choose. In approximately one-half of the dyads, the child made these decisions by herself or himself, and the decisions were made jointly by children and parents in the other half. Once the decision was made, the child would either click on the appropriate option or tell the parent which one to click.

Nature of interaction

Overall. With only two exceptions (i.e., Eliciting imitation, Having child retell part of story), all of the interaction behaviors of interest were exhibited by at least one of the dyads at some point while reading. Fig. 2 shows the frequency with which each behavior was exhibited across the sessions.

Fig. 2 about here

Apart from medium-specific behaviors such as pointing at the screen and showing or prompting children where to click, the most frequent parent behavior consisted of questions tying objects or events in the stories to the children's own lives. This was followed by labelling questions (e.g., "What's this?"), which occurred 11 times and were produced by all of the parents in the sample. Several parent behaviors occurred between 5 and 10 times, and were produced by approximately 1/2 of the dyads: attention calling, labelling, having children supply story information (e.g., "What kind of sandwich did he make?"), reviewing or explaining part of the story, statements tying objects or events to the children's own lives, and encouraging children to predict future events in the stories (e.g., "What do you think he is going to make next?").

Levels of abstraction. In examining parent-child interaction during reading of picture books, Sorsby and Martlew (1991) distinguished among four levels of abstraction in parents' questions to their children: (1) matching perception (i.e., requiring children to focus on only one items of perceptually available information, e.g., "Where is his nose?"), (2) selective analysis of perception (i.e., requiring children to integrate perceptually available items, e.g., "Are these the same or different?"), (3) reordering representation (i.e., requiring children to invoke ideas and concepts that are related to the book but not perceptually available, e.g., "What did we see when we went to the circus?"), and (4) reasoning about representations (i.e., requiring children to perform mental manipulation on decontextualized material, possibly via a number of cognitive steps, e.g., "Why will the head fall off?"). Their data showed that parents' talk about picture books clustered most heavily (and by a considerable margin) in levels 1 and 3.

As Figure 3 indicates, a very similar distribution was found here in the context of online storybooks. When recoded in line with Sorsby and Martlew's (1991) analysis, the utterances of parents in the present study also clustered most heavily in levels 1 and 3. Since parents and children were engaged in conversation, it is not surprising that children's utterances, too, formed a similar distribution.

Fig. 3 about here

Discussion

Because of the small sample size in this exploratory study, and because comparisons to traditional book reading employ data from past studies rather than within-subject comparisons, the data must be interpreted with caution. That said, however, these data suggest several conclusions regarding parent-child interaction while reading online storybooks and their use of the online medium in general.

First, it appears that online storybooks can promote many of the same kinds of positive behaviors that have been observed in joint reading of traditional books: labelling objects, tying events in the story to children's own experiences, and so on. In addition, parents' questions during online storybook reading place representational demands on children that require levels of abstraction similar to those that have been seen in the context of traditional books. Taken together with Lemish and Rice's (1986) data on parent-child interaction while watching television, this suggests that it is the narrative (or, in some studies, expository) context that stimulates such interactions, rather than the specific medium at hand.

Second, it is notable that when parents and children reached choice points in the online storybooks, almost all of the children either made the choices themselves or made them jointly with their parents. One of the behaviors that educators have proposed as beneficial in joint reading of traditional storybooks is asking children to predict what will happen next in the story (e.g., State Superintendent of Public Instruction, 1996; Teale & Sulzby, 1989). Yet, the interactive nature of branching, online stories means that this type of behavior can be taken one step further: Since they were the ones who made the decisions at the choice points, the children in this study not only predicted, but actually *determined* the course of subsequent story events. In this way, children actually participated in constructing the stories themselves, an activity that could make some small contribution to children's developing skills in writing and composing stories, as well as their perceptions of themselves as people who can create stories.

Finally, this exploratory study also holds an important implication for the study of families' use of computers and the online medium itself. Often, discussions of the interactive nature of computer use refer to interaction between a user and the computer (e.g., Shneiderman, 1998). Although such interaction is certainly worthy of study, both in understanding people's use of computers and in maximizing the usability of interface design, we also must recognize that computer use does not take place in a vacuum. As the present data illustrate, understanding the human interaction that occurs among users in *front* of the screen is equally important.

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Appendix

Coding scheme used in the present study

I. PARENT BEHAVIORS

A. Initiating Interaction with Child

1) Designating/Labeling
   (a) attention calling ("Look at that bird," "Look, it is a silly sandwich.")
   (b) labeling ("That's a gorilla," "That's Bert.")
   (c) labeling questions ("What does this say?," "Who is that?")
   (d) nonverbal referencing to screen (i.e. pointing)
   (e) eliciting imitation ("say Goodnight Grover")

2) Story/Comprehension related
   (a) having child retell part of story ("What kind of sandwich did he make?")
   (b) encouraging child to predict future events/actions ("Do you think he is going to get sick?," "What is he going to tell her?")
   (c) asking about characters' thoughts/motivations/traits/disposition, etc. ("Why do you think Bert doesn't want the sandwich?")
   (d) having/asking child to read/supply story information ("You can read this page," "What does this say?")
   (e) reviewing/explaining part of story ("Remember, he saw the big shadow and he got scared.")
   (f) anticipating future events ("Let's see what happens.")

3) External references
   (a) questions tying objects to child's life ("Do you like oatmeal too?")
   (b) statements tying objects to child's life ("You've never had cottage cheese before.")
   (c) questions tying events to child's life ("What do you do when it is time for you to go to bed?")
   (d) statements tying events to child's life ("Your bed squeaks like that too.")
   (e) general knowledge questions/statements ("Why don't you start to count?")

4) Medium-specific references
   (a) prompting child to click ("Click the button.")
   (b) showing/telling/asking where on screen to click (by pointing, etc) ("Try clicking on the basket.")
   (c) showing which button on mouse to press ("Push the one on the left.")
   (d) parent clicking to next page
   (e) asking child to choose option ("What should he do, hide under the bed or explore?")
   (f) choosing option for child ("Let's try this one.")
   (g) asking/telling child to "turn page"
      (i) nonverbally asking/telling child to "turn page" (i.e. pointing)
   (h) assisting child by familiarizing with mouse/clicking ("You have to double click it, fast.")

(i) asking child to elaborate upon option ("Are you sure you wanted the bananas?")
(j) comments/questions/concerns dealing with computer difficulties, crashes, confusion(s) etc ("Wait a minute, nothing is happening.")
(k) comments/questions/concerns about turn-taking with mouse ("My turn.")

5) Miscellaneous exclamations/outbursts/questions
(a) verbal ("wow," "yeah")
(b) laughter
(c) nonverbal (nodding, shaking head, etc)
(d) non-labeling, comprehension Wh. Questions

6) Parent reads page [IA6]

7) Inaudible/Incomprehensible [IA7]

B. Responding to Child

1) Designating/Labeling
(a) repeating after child ("Yes, there's his mommy.")
(b) expanding on child's utterance ("Yes, that's Ernie, what is he doing?")
(c) acknowledging child's utterance/pointing ("Yes, I know")
(d) correcting inaccuracies in labeling ("No, that's Ernie, the other one is Bert.")
(e) nonverbal referencing to screen (i.e. pointing)
(f) eliciting imitation
(g) answering question ("Yes, we are reading a book about bedtime.")
(i) labeling ("yes, that's a picnic.")
(h) other responses

2) Story/Comprehension related
(a) answering questions ("I don't know what will happen next.")
(b) correcting inaccuracies in plot ("I don't think that's what happened.")
(c) providing additional descriptions/definitions ("Oh, I think he's in the kitchen now, I think that's where this story takes place.")
(d) having child retell part of the story ("What happened to Grover in the story?")
(e) acknowledging child's utterance ("You are right," "A monster, that's right.")
(f) anticipating future events or response/acknowledgement of child's anticipation ("Let's see what happens")
(g) reviewing/explaining part of story ("Right, he made a silly sandwich.")

3) External references
(a) responding to child's questions/statements by tying objects in story to child's life ("Well, if you aren't scared at bedtime, why do you always come into my room?"
(b) responding to child's questions/statements by tying events to child's life ("How do you know if you like cottage cheese, you have never had it.")
(c) acknowledging/following-up child's utterance ("Yes, that's right, you do eat oatmeal.")

4) Medium-specific references
   (a) responding to question/request/comment/action by prompting child to click ("You can click to see what happens next.")
   (b) responding to question/request/comment/action by showing/telling where on screen to click ("To get to the next page, click on the duckie.")
   (c) responding to question/request/comment/action by showing which button on mouse to press ("Press the button on the right.")
   (d) responding to question/request/comment/action by clicking to next page ("Maybe the answer is on the next page, let's see.")
   (e) responding to question/request/comment/action by asking child to choose option ("I don't know, pick on and we'll find out.")
   (f) responding to question/request/comment/action by choosing option for child ("Let's click on the picnic basket.")
   (g) responding to question/request/comment/action by asking/telling child to "turn page"
   (h) responding to question/request/comment/action by assisting with mouse/clicking
   (i) acknowledging child's choice (of option) ("Great, click on the blanket.")
   (j) acknowledging child's clicking question(s) ("Yeah, that's how you do it.")
   (k) comments/questions/concerns dealing with computer difficulties, crashes, etc ("Nothing is happening.")
   (l) comments/questions/concerns about turn-taking with mouse ("My turn")

5) Miscellaneous exclamations/outbursts/questions
   (a) verbal ("wow," "yeah")
   (b) laughter
   (c) nonverbal/physical (nodding, shaking head, etc)
   (d) non-labeling, comprehension Wh. Questions

6) Inaudible/Incomprehensible [IB6]

II. CHILD BEHAVIORS

A. Initiates Interaction (with Parent)

1) Designating/Labeling
   (a) attention calling (i.e. look at ____) ("Mommy, look, it's Bert")
   (b) labeling (i.e., that's a ___) ("He has a snake.")
   (c) labeling questions—asking parent Wh questions. ("What is that in the bed?")
   (d) nonverbal referencing to screen (i.e. pointing)
   (e) pointing + unintelligible speech

2) Story/Comprehension related
   (a) asking content question ("Why is he not hungry?")
   (b) identifying a cause/effect sequence

(c) retelling part of story ("He thought it was a monster but it wasn't.")
(d) predicting future events/actions—asking to predict…
(e) describing/asking about characters' thoughts/motivations ("He is scared.")
(f) reading with/without parent (I can read it, it says Ernie.")
(g) laughs
(h) anticipating future events ("Let's see what happens")

3) External references
(a) questions concerning relation of objects to own life ("Can I eat that?")
(b) statements tying objects to own life ("That is like my teddy bear.")
(c) questions concerning relation of events to own life ("Is that a picnic like we had?")
(d) statements tying events to own life ("Mommy reads me stories too.")

4) Medium-specific references
(a) prompting parent to click ("Click now.")
(b) showing where on screen to click ("Mommy, click the bird.")
(c) clicking to next page
(d) asking parent to choose option ("What should we do?")
(e) choosing option ("I want the pretzels.")
(f) asking/telling parent to "turn page" or if he/she can turn page
(i) nonverbally (i.e. pointing)
(g) operative questions/comments (e.g. speed) concerning medium, how to get it on, etc… ("Nothing is happening.")
(h) asking clicking questions ("Should I click?")
(i) comments/questions/concerns dealing with computer difficulties, crashes, etc ("It is broken.")
(j) comments/questions/concerns about turn-taking with mouse ("My turn.")

5) Miscellaneous exclamations/outbursts/questions
(a) verbal (i.e. wow, yeah, great)
(b) laughter
(c) nonverbal (nodding, shaking head, etc)
(d) non-labeling, comprehension Wh. Questions

6) Inaudible/Incomprehensible [IIA6]

B. Responding to Parent

1) Designating/Labeling
(a) repeating after parent ("Silly sandwich.")
(b) labeling in response to parent attention calling ("That's Grover.")
(c) labeling in response to parent questions ("That's a blanket.")
(d) nonverbal referencing to screen (i.e. pointing) in response to parent attention calling
(e) nonverbal referencing to screen (i.e. pointing) in response to parent questions
(f) imitation upon parent elicitation ("Yeah, chocolate.")
(g) asking question in response to parent attention calling ("Why is he eating?")

2) Story/Comprehension related
   (a) retelling part of story (upon parent's request) ("Bert wasn't hungry.")
   (b) predicting future events/actions (upon parent's request) ("Grover is gonna be scared.")
   (c) describing characters' thoughts/motivations (upon parent's request) ("Grover is scared.")
   (d) reading with/without parent (upon parent's request) ("It says Ernie and Bert.")
   (e) responding with I don't know
   (f) anticipating future events (i.e. "let's see what happens") or response/acknowledgement of parent's anticipation

3) External references
   (a) making comments tying objects in story to own life ("That's my bear.")
   (b) making comments tying events in story to own life ("I have bedtime.")
   (c) other responses to parents' attempts to tie objects in story to child's life ("I like cottage cheese.")
   (d) other responses to parents' attempts to tie events in story to child's life ("I'm not scared like him.")
   (e) responses to parents' general knowledge questions/statements

4) Medium-specific references
   (a) clicking screen
   (b) showing where on screen to click ("Mommy, click the duckie.")
   (c) clicking to next page
   (d) choosing option (vocally or silently) ("I want the chocolate.")
   (e) elaborating upon option ("Yeah, pick that one, I want it.")
   (f) asking clicking question ("Where should I do it?")
   (g) comments/questions/concerns dealing with computer difficulties, crashes, etc ("It is too slow.")
   (h) comments/questions/concerns about turn-taking with mouse ("My turn.")

5) Miscellaneous exclamations/outbursts/questions
   (a) verbal (i.e. wow, yeah, great)
   (b) laughter
   (c) nonverbal (nodding, shaking head, etc)
   (d) non-labeling, comprehension Wh. Questions

6) Inaudible/Incomprehensible (IIB6)

Figure 1. Sample story pages, including choice point (Fig. 1a) and the two possible next pages that follow (Fig. 1b and 1c), depending upon the reader's choice.

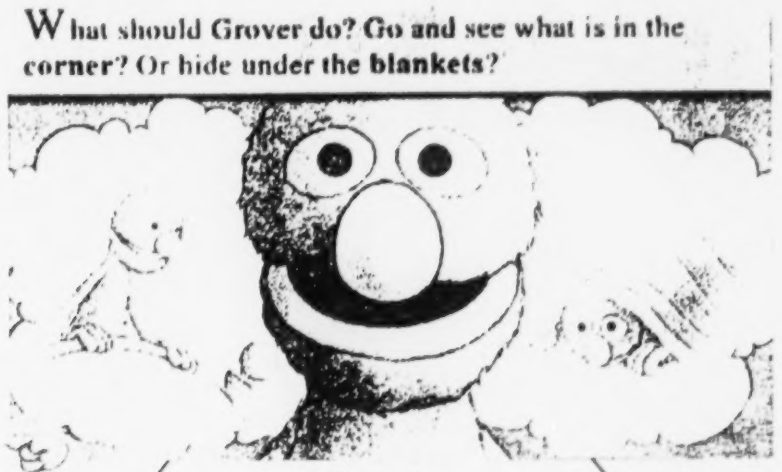

Figure 1a

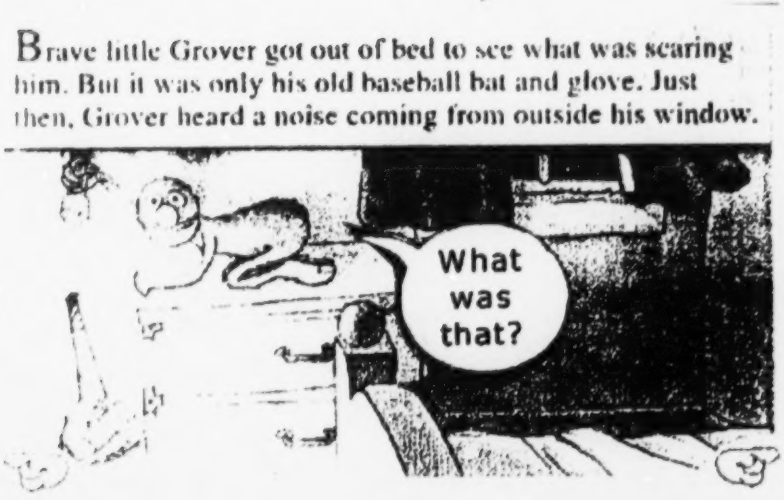
Brave little Grover got out of bed to see what was scaring him. But it was only his old baseball bat and glove. Just then, Grover heard a noise coming from outside his window.
What was that?

Figure 1b

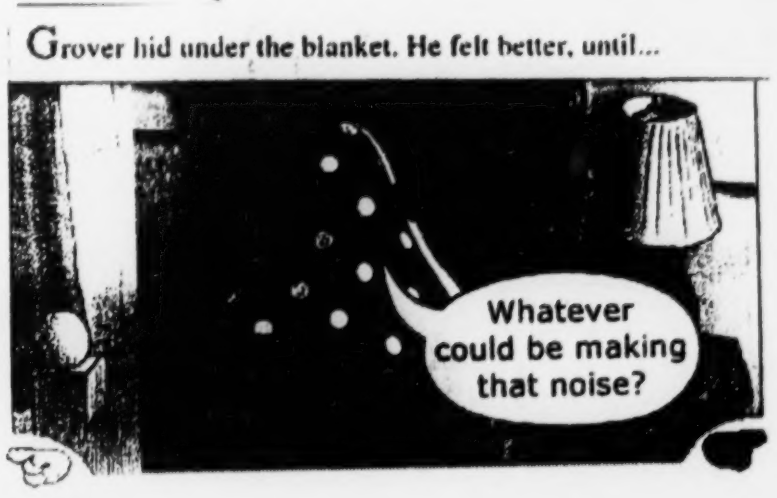

Figure 1c

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Figure 2. Frequency with which each behavior of interest was exhibited across the sessions: Behaviors initiated by parent (Fig. 2a), parent responses (Fig. 2b), behaviors initiated by child (Fig. 2c), and child responses (Fig. 2d).

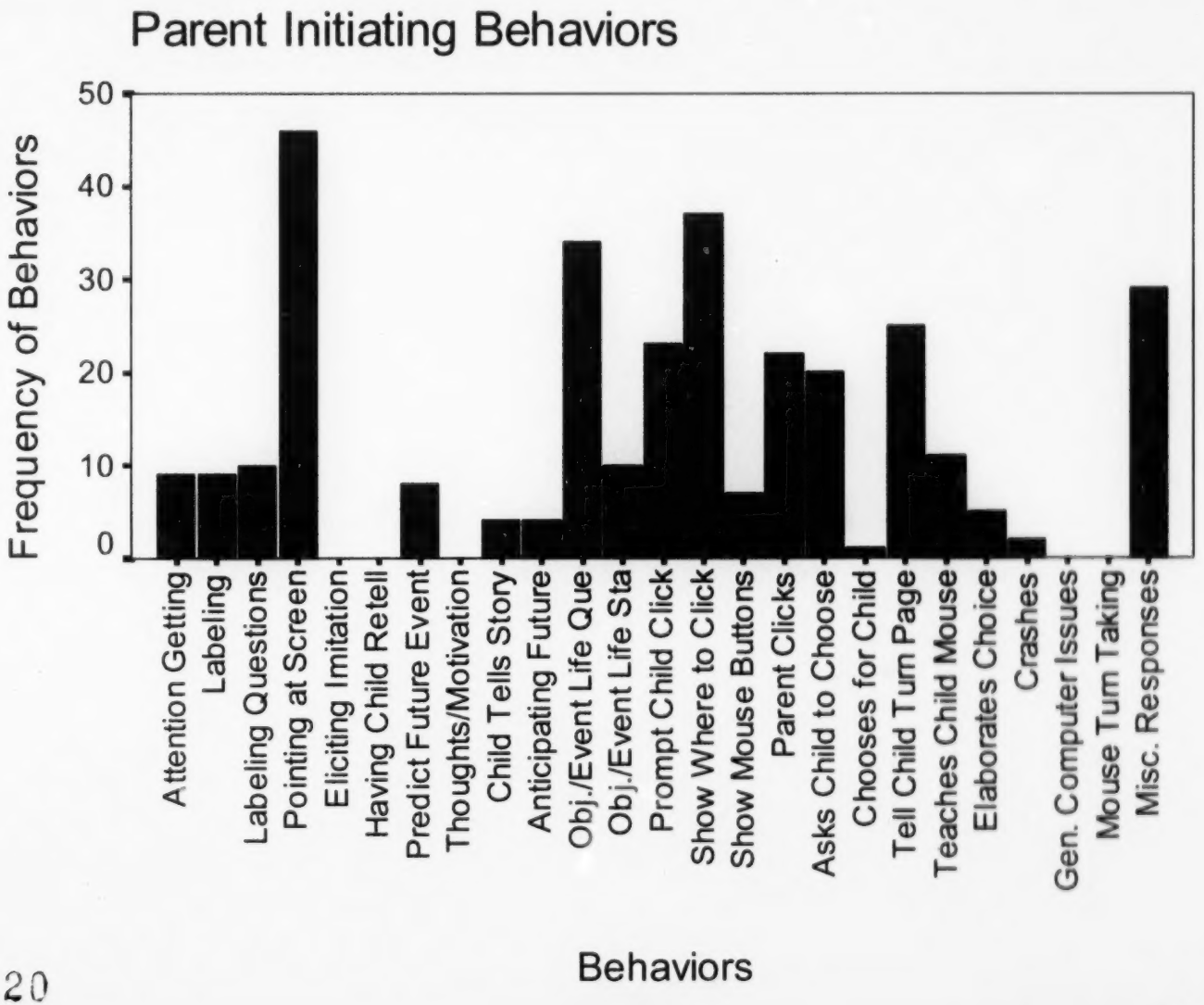

Figure 2a

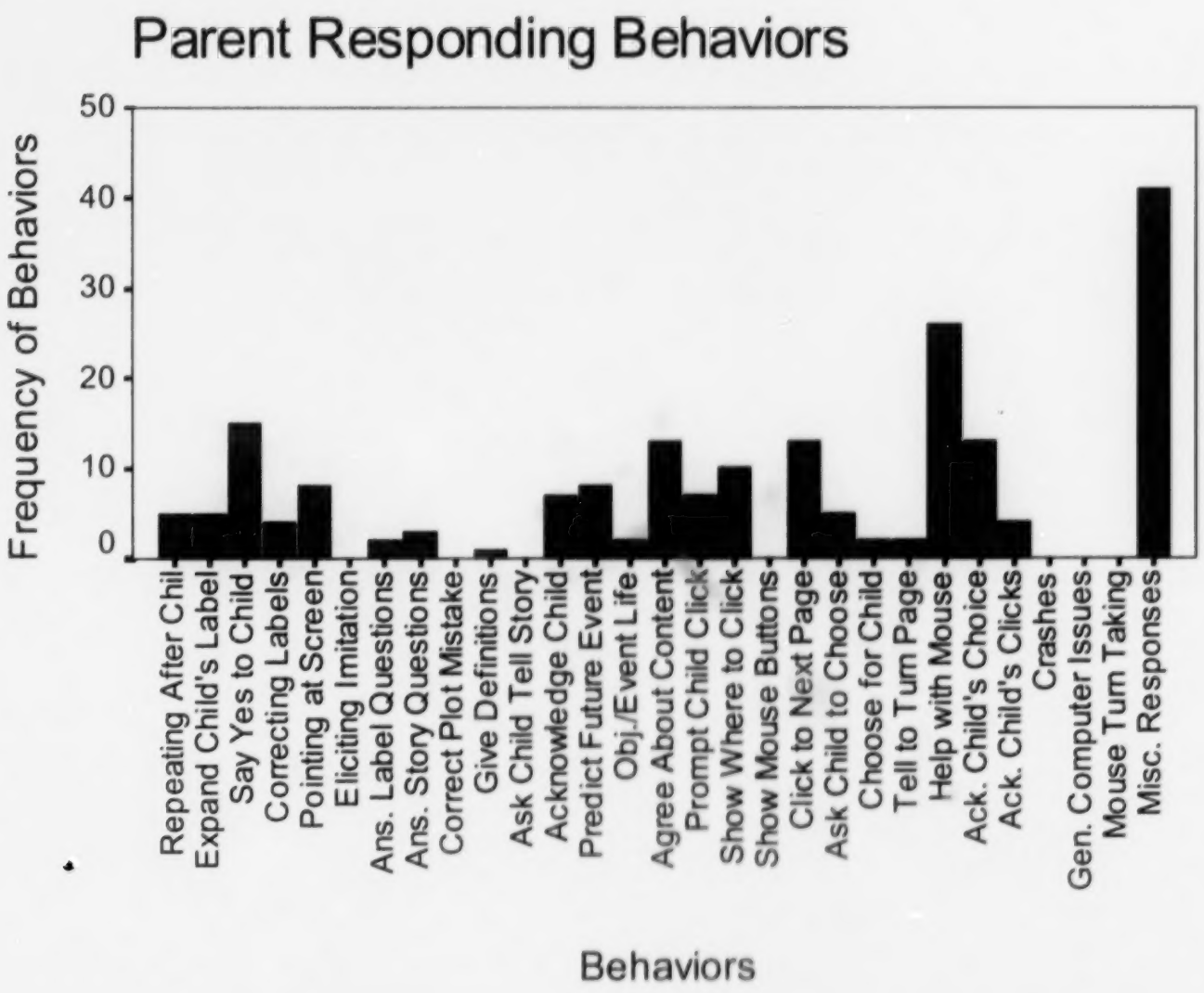
Parent Responding Behaviors
Frequency of Behaviors
50
40
30
20
10
0
Repeating After Chil
Expand Child's Label
Say Yes to Child
Correcting Labels
Pointing at Screen
Eliciting Imitation
Ans. Label Questions
Ans. Story Questions
Correct Plot Mistake
Give Definitions
Ask Child Tell Story
Acknowledge Child
Predict Future Event
Obj./Event Life
Agree About Content
Prompt Child Click
Show Where to Click
Show Mouse Buttons
Click to Next Page
Ask Child to Choose
Choose for Child
Tell to Turn Page
Help with Mouse
Ack. Child's Choice
Ack. Child's Clicks
Crashes
Gen. Computer Issues
Mouse Turn Taking
Misc. Responses
Behaviors

Figure 2b

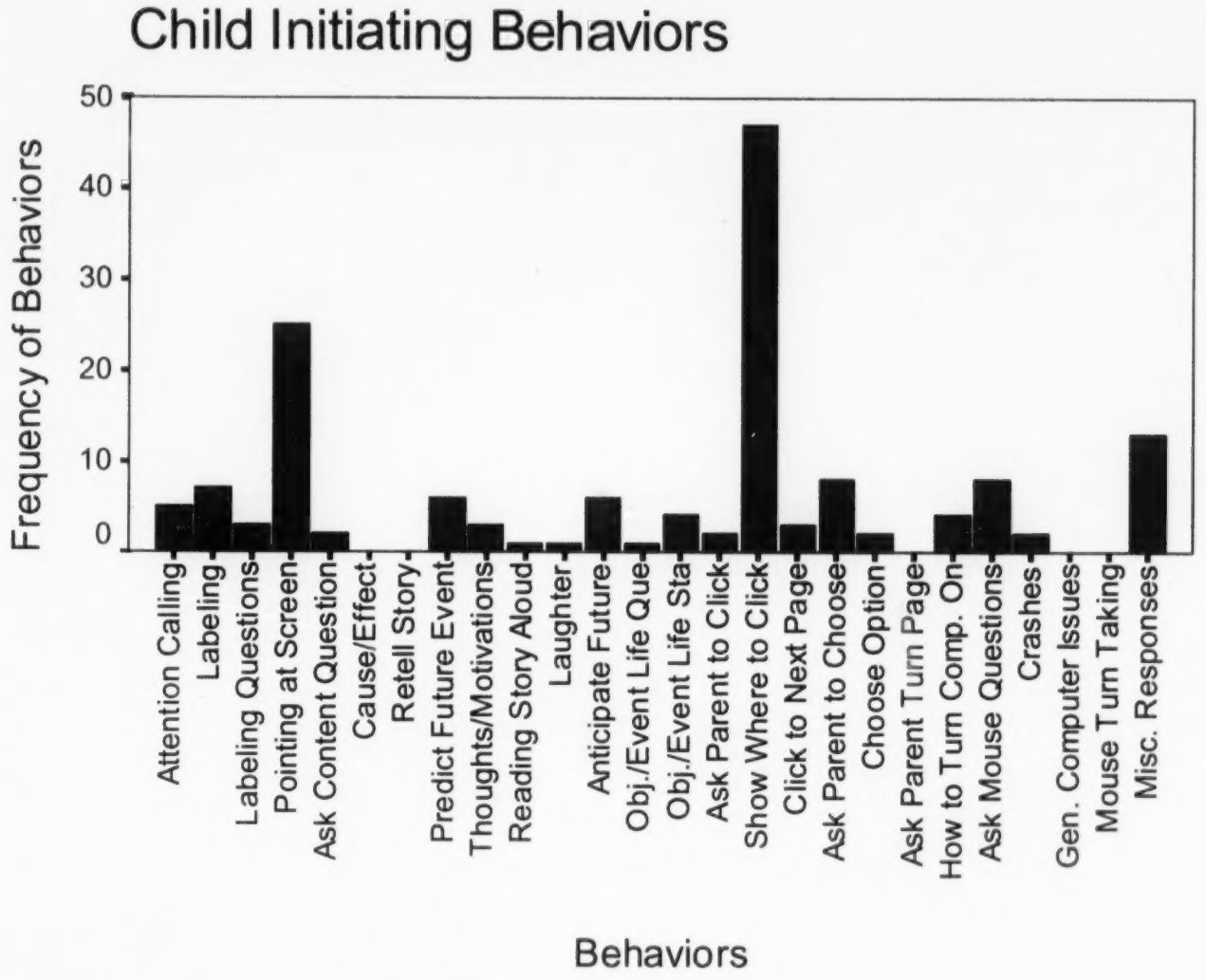
Child Initiating Behaviors
Frequency of Behaviors
50
40
30
20
10
0
Attention Calling
Labeling
Labeling Questions
Pointing at Screen
Ask Content Question
Cause/Effect
Retell Story
Predict Future Event
Thoughts/Motivations
Reading Story Aloud
Laughter
Anticipate Future
Obj./Event Life Que
Obj./Event Life Sta
Ask Parent to Click
Show Where to Click
Click to Next Page
Ask Parent to Choose
Choose Option
Ask Parent Turn Page
How to Turn Comp. On
Ask Mouse Questions
Crashes
Gen. Computer Issues
Mouse Turn Taking
Misc. Responses
Behaviors

Figure 2c

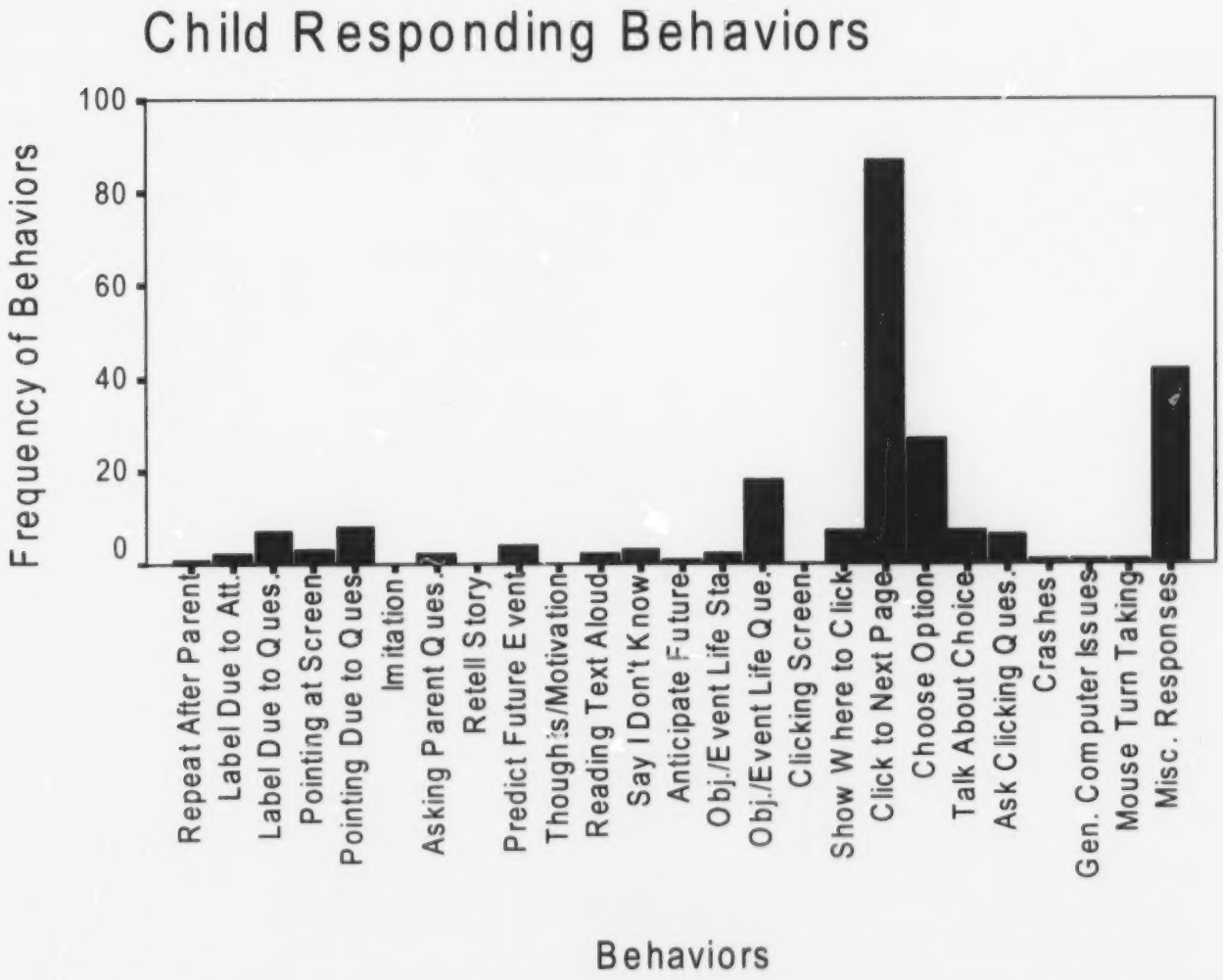
Child Responding Behaviors
Frequency of Behaviors
100
80
60
40
20
0
Repeat After Parent
Label Due to Att.
Label Due to Ques.
Pointing at Screen
Pointing Due to Ques
Imitation
Asking Parent Ques.
Retell Story
Predict Future Event
Thoughts/Motivation
Reading Text Aloud
Say I Don't Know
Anticipate Future
Obj./Event Life Sta
Obj./Event Life Que.
Clicking Screen
Show Where to Click
Click to Next Page
Choose Option
Talk About Choice
Ask Clicking Ques.
Crashes
Gen. Computer Issues
Mouse Turn Taking
Misc. Responses
Behaviors

Figure 2d

Figure 3. Mean number of utterances per dyad at four levels of abstraction: Parent and child utterances.